# The Altimeter

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We infantrymen pride ourselves on being expert battlefield navigators. Generally, we use a map and a compass, but there is another tool, the altimeter, that can also be useful.

One company, for example, had completed a portion of a movement to contact through rugged snow-covered mountainous terrain in mid-January and was eagerly awaiting resupply for its fatigued and chilled troops. The company had been told its logistical package was in the area. Darkness arrived with the company reporting it could hear the support vehicle in the distance and was sending a carrying party to try to find it. After an hour, the party had not managed to find the vehicle although they could hear its engine.

After increasingly urgent radio traffic between the battalion and the company, a check of the company's altimeter revealed that the company's location was nearly 600 feet higher than its assigned objective. Since a 60mm mortar platoon was conducting an illumination ARTEP mission in the immediate area, the battalion notified the company to watch for the burst and call back the magnetic azimuth from its position. A quick grid-to-magnetic angle conversion and resection from the known bursting point of the illumination round produced a line on the map that crossed the contour line the company had reported as its elevation. The company proved to be more than two kilometers from its supposed location.

Using the altimeter had saved several hours in reestablishing contact with the company. And, of course, using it earlier would have saved the company the embarrassing error in the first place.

Civilian mountaineers have long relied on the altimeter as a vital navigational aid, and modern manufacturing processes have resulted in an amazingly durable precision instrument. The heart of an altimeter is a metallic vacuum chamber that expands or contracts in response to changes in outside air pressure. Over an elevation change of 15,000 feet, the vacuum chamber expands only about 0.75mm, and this expansion is translated through a gear mechanism to the indicator needle. The change in outside air pressure may be either from changes in elevation, since air pressure decreases as we gain altitude, or from changes due to the passage of weather systems. Most altimeters also have a scale that shows the air pressure in millibars or inches of mercury, thus making it useful as a normal barometer as well as an altimeter. An altimeter, then, is little more than a barometer that has been calibrated to show changes in elevation.

The Thommen altimeter, currently in service with the 3d Battalion, 172d In-

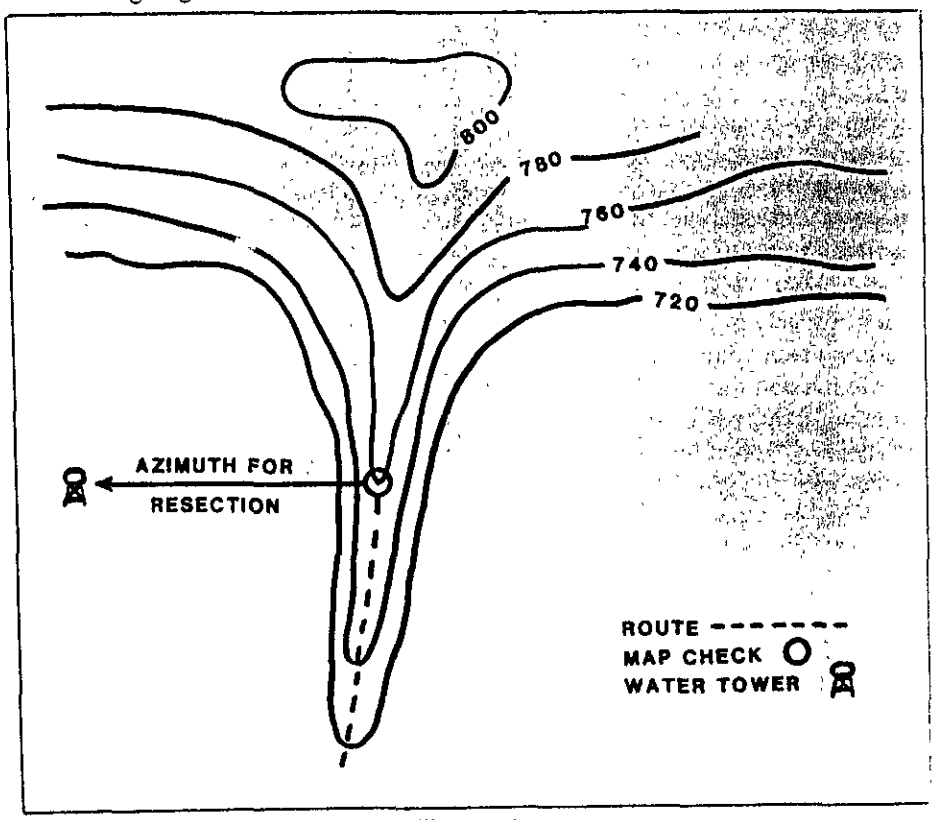


Figure 1

fantry (Mountain), Vermont National Guard, is accurate to within ten meters. Since many 1:50,000 scale military maps have a contour interval of ten meters, this altimeter provides a reading that is accurate to within one contour interval. The smaller the interval, of course, the more accurately the altimeter will fix a position.

Several examples will illustrate situations in which the altimeter can be useful to an infantryman, not just in mountainous terrain, but also in rolling wooded terrain:

• Picture yourself ascending a path on a narrow ridge. You decide to do a map check using your altimeter while your more traditional assistant patrol leader does a map check using his compass. You glance at your altimeter and see that it reads 760 meters, then check the map to see where your path crosses the 760-meter contour line (Figure 1). You have taken 30 seconds to check your position, while cradling your rifle in your left arm and continuing to move along with the rest of the patrol. Meanwhile, your assistant stops, shoots an azimuth to a water tower, converts from magnetic to grid azimuth, figures the back azimuth, finds his protractor and makes a tic mark on the map, uses his bayonet to draw a more-or-less straight line from the tower back across the path, and finally has an estimate of his position. This takes him a good deal more than 30 seconds.

• You are on a rounded hillside and need to check your position. Your compass shows that at your position the hillside falls away on a grid azimuth of 270 degrees. Your altimeter shows that you are at 300 meters. You draw a line on the map down the hillside on this azimuth and note the point where it crosses the 300-meter contour line (Figure 2).

• At a certain point, you want to leave a ridge and proceed at a certain elevation for a few hundred meters to establish a patrol base. Although this is an illusory goal for some novice navigators, with an altimeter, it is easy to do (Figure 3).

• While using a ridgeline to your left as a handrail, you are proceeding on a magnetic azimuth when you run into an obstacle that forces you to detour several hundred meters downhill to your right

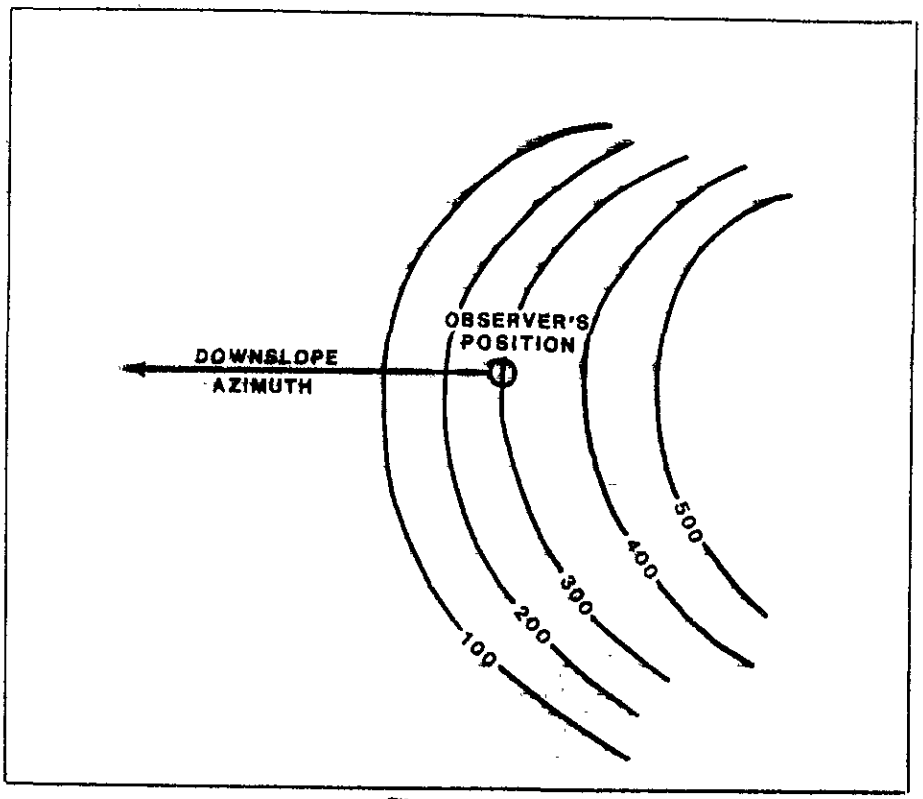

Figure 2

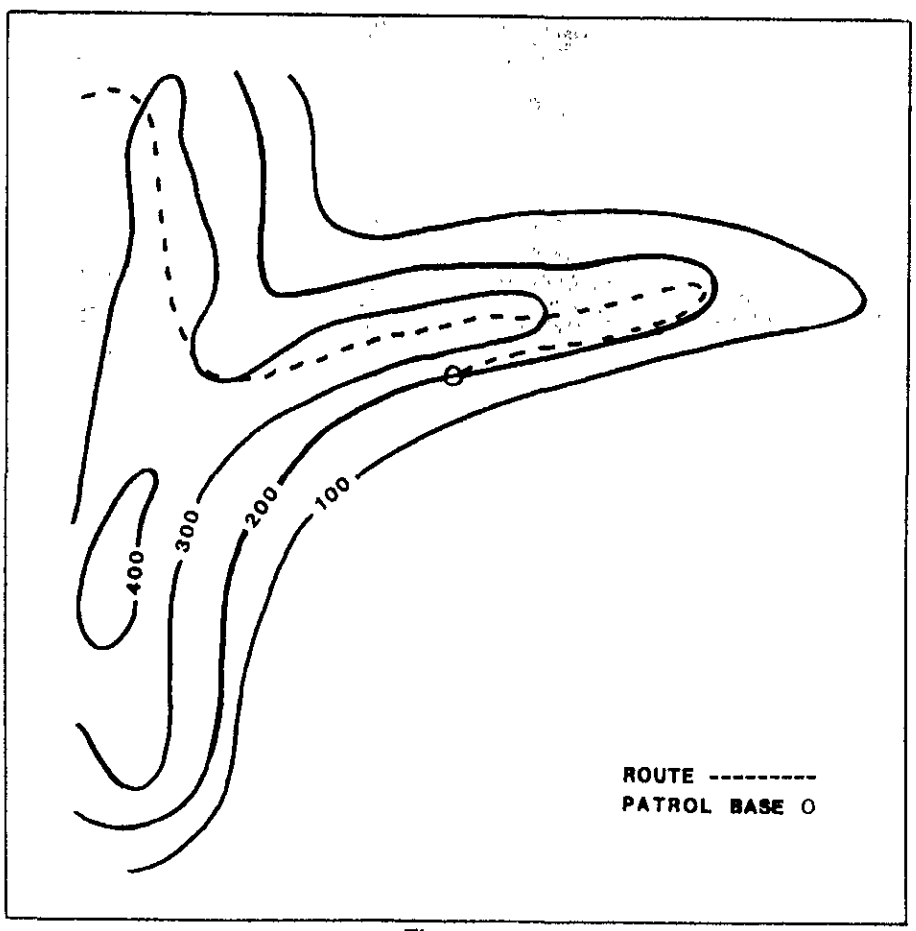

Figure 3

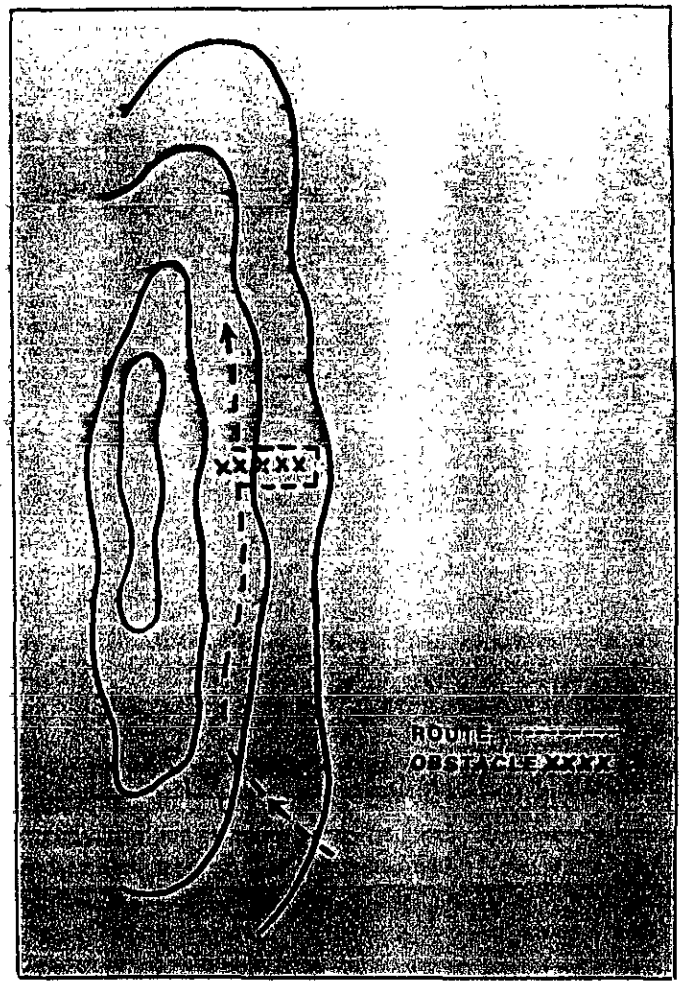


Figure 4

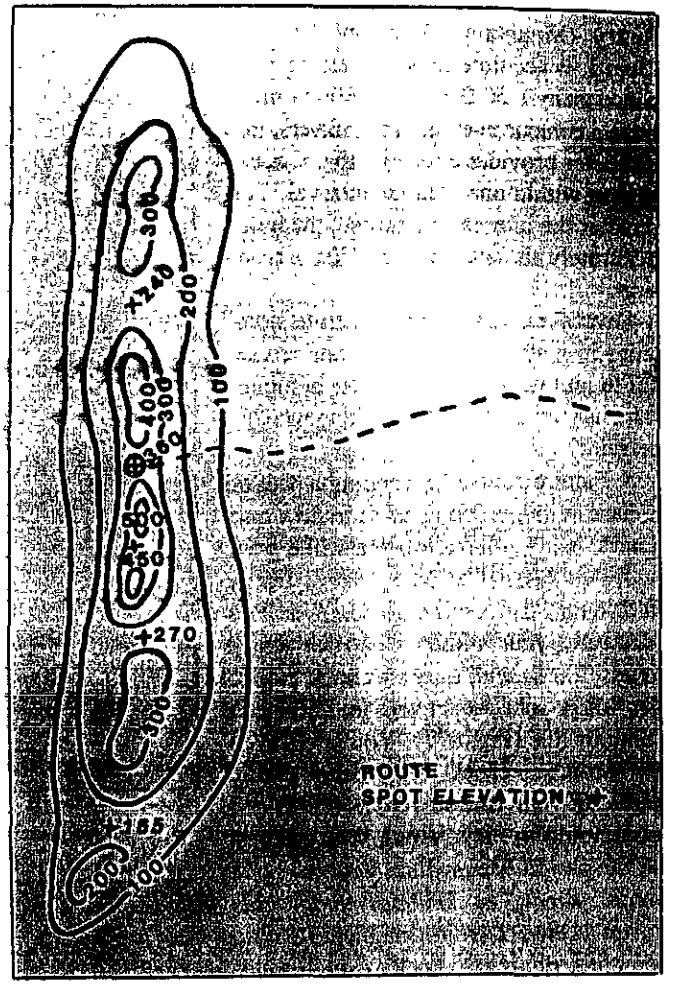


Figure 5

(Figure 4). The terrain is steep, slippery, and thick with mountain laurel so that the downhill leg of your detour renders your pace count a matter of fiction. The obstacle is only about 20 meters deep, then you begin the uphill leg of the detour. Luckily, you had the presence of mind to check your elevation before beginning the detour, so you claw your way back up through the mountain laurel until you reach your original elevation and resume travel along your original course.

• You are crossing a low wooded ridge through a saddle after a 2,000-meter straight shot through a generally featureless forest (Figure 5). The problem is that you cannot see out of the forest to do a resection even from the ridge, and there is a series of saddles along the ridge. Because you are a tactical patrol rather than a survey party, your azimuth tracking has been good but not definitive, and you believe that you could be as much as 200 meters either left or right. The difference in elevation between the saddles is significant, and your altimeter confirms which saddle you have reached, saving you the task of running back and forth along the ridge trying to find which saddle is which.

In addition to navigating, an experienced infantryman also has a personal commitment to accurate weather forecasting. Because an altimeter is also a barometer, the changes in atmospheric pressure give him further information to use in predicting weather changes.

An altimeter does have some limitations. Since changes in atmospheric pressure affect its accuracy, an altimeter needs to be checked at points of known elevation, as does movement from underneath one "vertical column of air" to another. Also, as with the compass, limitations in map accuracy also affect the use of the altimeter.

Whether an altimeter will benefit a given unit depends on the terrain over which it operates. Obviously, the more three-dimensional the terrain, the more an altimeter will earn its keep. But soldiers who have even a rudimentary degree of competence with an altimeter find themselves navigating in hilly terrain with map and altimeter almost to the exclusion of the compass. And they do it faster and more accurately.

So next time you look at a map, think whether an altimeter might help you follow your route.

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